

Appl. No. 10/662,109
Response dated 03/03/06
Reply to Office Action of 11/03/05

REMARKS

Claim 1 has been amended. Claims 2 - 5 are presented as originally written.

The Examiner has accorded a priority date of 09/12/03, the filing date of the present application, to claims 1 and 3 - 5. Claim 2 has been accorded a priority date of 09/12/02, the filing date of the provisional application to which the present application claims priority. The Examiner finds that the underlying provisional application does not support the limitation "... about 0.01 percent" of claims 1 and 3 - 5. Accordingly, independent claim 1, from which claims 3 - 5 all ultimately depend, has been amended to recite "... about 0.05 percent," which limitation is supported by the provisional.

Claims 1 and 3 - 5 have been rejected under 35 USC §102(a) as being anticipated by Cho et al. Although the Examiner does not state the basis for this rejection, since it is claims 1 and 3 - 5 that are rejected and since the effective date of the reference is after the provisional application filing date and before the utility application filing date, it is assumed that the rejection is based on the later priority date accorded to claims 1 and 3 - 5, as discussed above. In view of the present amendment to claim 1 to include a limitation supported by the provisional application, it is requested that the Examiner reconsider and withdraw the present rejection.

Claims 1 - 5 have been rejected under 35 USC §102(b) as anticipated by or, in the alternative, under 35 USC §103(a) as obvious over Andrews et al. The Examiner notes that Andrews et al. disclose composite fibers made by dispersing SWNT in isotropic petroleum pitch and subsequently carbonizing the pitch. The Examiner then argues that although the reference discloses addition of nanotubes to isotropic pitch as opposed to

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mesophase pitch, the resultant carbonized products would be identical, finding that specifically the subsequent carbonation heat treatment would result in an identical microstructure. However, Applicants respectfully submit that one of ordinary skill in the art would recognize that carbon fibers formed from isotropic pitch are completely random and completely lacking in graphitic structure. Non-modified mesophase pitch-based carbon fibers are highly ordered as is seen in the Figure 3 of the present application. This radial structure of graphene layers can be as one large domain. By introducing a very small amount of carbon nanomaterials the present invention introduces a degree of randomness to mesophase pitch-based carbon fibers; it substitutes the one large domain, which is subject to brittle failure, with a plurality of smaller domains. As is noted in the paragraph bridging pages 6 and 7 of the specification the carbon nanomaterials essentially act as nucleation sites about which the graphene layers form. Yet, the final fiber is still graphitic in nature. Thus, whereas in the reference carbon nanomaterials are added to isotropic pitch as reinforcements to form stronger fibers, in accordance with the present invention carbon nanomaterials are added to mesophase pitch to disturb the texture of the final fibers. Accordingly, it is submitted that the resultant carbonized products of the present invention and Andrews et al. reference would not be identical in any way and it is requested that the Examiner reconsider and withdraw the present rejection under 35 USC §102(b).

With respect to the obviousness rejection, it is submitted that the statement in Andrews et al. that it would be interesting to see the effect of the addition of nanotubes to carbon pitch fibers does not suggest or render obvious the present invention. That is, as

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noted above, Andrews et al. employ nanomaterials as reinforcements, as is typical in dispersed phase composite technology. The nanomaterials are loaded into the isotropic pitch at up to 10 percent by weight in order to increase tensile strength, modulus and electrical conductivity. In accordance with the present invention, very small amounts of carbon nanomaterials are added to mesophase pitch in order to decrease modulus. Thus, it is argued that from a reading of the statement of Andrews et al. regarding the possibility of incorporating nanomaterials into mesophase pitch one of ordinary skill in the art may be motivated to attempt higher loadings of nanomaterials looking for increased physical properties but would fail. It is counterintuitive, from a reading of the one statement of Andrews et al. highlighted by the Examiner and from a reading of the reference as a whole, to assume that anyone would be motivated to attempt low loadings, especially as low as the preferred range of from about 0.1 to about 0.5, without the benefit of the hindsight gained from the present specification. Accordingly, it is requested that the Examiner reconsider and withdraw the present rejection under 35 USC §103(a).

Claims 1 – 5 have been rejected under 35 USC §103(a) as being unpatentable over either Klett et al. or Stiller et al. Klett et al. is directed to a complex composite which includes mesophase pitch and carbon nanotubes as part of a laundry list of components including a solvent, a dispersant, an anti-foaming agent, a monomer system and an initiator system. Clearly, as a part of this multicomponent system the interaction of carbon nanoparticles and a mesophase pitch is irrelevant to the structure and properties

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of the present carbon fiber. Thus, it is submitted that the present claims are not rendered obvious by the Klett et al. reference.

Stiller et al. is directed to a method for making an anisotropic or isotropic carbon foam including introducing at least one reinforcing additive in an amount of about 2 to 8 weight percent. However, although the present claims are not method claims, the method by which the foam is made is so significantly different from the method by which the present carbon fibers are made that the present fibers' structure and properties, specifically the interaction of the nanomaterials with the mesophase pitch during carbon fiber formation, cannot be rendered obvious by Stiller et al. Accordingly, it is requested that the Examiner reconsider and withdraw the present rejection.

Thus, it is submitted that the present application is in condition for allowance and such action is respectfully requested.

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